USING A MOTOR IMAGERY TRAINING PROGRAM TO REDUCE FALL RISK AMONG THE ELDERLY

An Undergraduate Research Scholars Thesis

by

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ABSTRACT

Using a Motor Imagery Training Program to Reduce Fall Risk Among the Elderly. (May 2015)

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Falls contribute to the elderly's highest number of unintentional injuries. Clearly, falling has significant implications in our aging population. Reach movements typically performed by the elderly are linked with fall incidence. There is a problem with the elderly mentally representing intended actions such as reaching and fall risk. Furthermore, a motor imagery training program is believed to improve motor planning and reduce fall risk. The purpose of this study was to determine if a reach-specific motor imagery training program could improve reach planning and potentially reduce fall risk. The present study involved a group of 23 older adult participants, aged 65-81 years, recruited from South Texas. Participants were divided into three groups: a control group (*Group 1*) consisting of 9 participants, and two intervention groups categorized by age, *Group 2* (65 to 73 years) and *Group 3* (74 to 81 years). The intervention groups were administered a reach-specific imagery training program three days a week over the course of 4 weeks. Participants were pre- and post-tested on estimation of reach via use of motor imagery in three conditions: seated, standing-on-2-feet, and standing-on-1-foot. The main hypothesis of this study was that motor imagery training will have a positive influence on reach-estimation, therefore improving motor planning and potentially reducing fall risk. Results indicated that the hypothesis was supported, showing that after training, participants that received the intervention

significantly improved their reach estimation, $p < .05$, whereas the *Group 1*'s scores did not change significantly. No noticeable difference was seen between the two intervention groups or between reach conditions. These findings suggest that motor imagery training has promise as an effective tool in reducing fall risk among the elderly.

DEDICATION

I dedicate this thesis to the people that devote their lives to research, work, and education in order to improve the lives of the elderly population. Thank you for your continued efforts in this field and for the support you have provided to the loved ones of many.

ACKNOWLEDGEMENT

I would especially like to thank my faculty advisor, Dr. Carl Gabbard, from the Department of Health & Kinesiology, Division of Motor Neuroscience at Texas A&M University, for all of the support, encouragement, advice, assistance, and amazing opportunities throughout my time here at Texas A&M.

SECTION I

INTRODUCTION

Falls and Fall Risk Among the Elderly

According to the Center for Disease Control and Prevention, "one out of three older adults (those aged 65 or older) fall each year [1]." Falls contribute to the highest number of unintentional injuries experienced by the elderly aged 65 years and older. Furthermore, in the next 17 seconds, an older adult will be treated for fall-related injuries, and in the next 30 minutes, an older adult will die from fall-related injuries [2]. The risk of falling continues to increase the older one gets, and over half of elderly adults aged 80 years fall yearly [1]. Even though these statistics are disturbing, the actual rate of falling occurrences is even greater, due to many incidents not being reported. Clearly, falling has significant implications for quality of life in our aging population.

Motor Planning and Reaching in Relation to Falls Among the Elderly

Research findings tell us that the elderly lack efficient action planning (motor planning) and that the most common reason for falls among the elderly is incorrect transfer or shift of bodyweight, like leaning too far from one's base for support [3]. From these reports, it can be concluded that reaching, especially inefficient reach planning such as over- or underestimation, can cause one to lean too far from their base of support, therefore increasing the risk of falling. In other words, many falls in the elderly can be directly linked to reaching.

Motor planning is used to estimate whether an object is reachable or not from one's current position. Research findings tell us that as one ages, one's mental representation for action

planning become less accurate and effective. For example, Gabbard and Cordova [4] discovered that the relationship between planned (simulated) reach distance and actual functional reach was weak. That is, their intentions did not match their actual capabilities and their movement estimation did not align with their actual action execution. Also, others have reported that the elderly experience significant difficulties with the ability to mentally plan and simulate simple and complex, sequential whole body movements such as walking [5, 6]. Taken together, these reports suggest that weak motor planning can prevent a person from determining actions their body needs in order to perform a motor task correctly and safely. Gabbard et al. [7] and Noel et al. [8] reported that overestimation of action capabilities in the context of reaching was a common observation among older adults. Both studies also noted how overestimation of actions could be a major fall risk. As previously stated, a recent review study that looked at the circumstances of falls in elderly people, determined that incorrect transfer or shift of bodyweight was the most frequent cause of falling (41% of all falls) [3]. Incorrect transfer or shift of body weight is defined as "self-induced shifting of bodyweight, causing the center of gravity to move outside the base of support" with the "imbalance [as an] internal rather than eternal [like a slip, trip, or stumble] perturbation." A specific example provided from the study is leaning too far from one's base of support.

Motor Imagery Training

Motor imagery is a form of mental representation and the ability to mentally visualize intended actions. More specifically, motor imagery involves visualizing (mentally representing) what a movement *feels* like, rather than visualizing what a movement *looks* like. A majority of motor programming theories support the view that motor imagery is one of the most important

components of effectively planning out actions [2]. Motor imagery, also known as kinesthetic imagery, is a rehearsal of movements from an internal or first-person perspective without any actual motion taking place. The key is for one to cognitively represent what the motion *feels* like, not just what the movement *looks* like from a first-person perspective. Ultimately, motor imagery is comparative to mental representation and motor planning. Additionally, studies have shown that there is a high association between real and simulated movements [9-12].

Motor imagery practice has been supported as effective in improving motor planning and control [2]. Additionally, evidence was reported by Wohldmann et al. [13] to support the theory that mental practice reinforces abstract mental representation that does not involve particular effectors. In other words, mental practice, like motor imagery training, reinforces 'central' features of the representation as well as representation of particular body part processes, such as the hands and fingers. Finally, in a study of the effectiveness of motor imagery practice conducted by Guttman et al. [14], practice had a positive effect on actual movement execution.

Intent of the Study

In review, research findings tell us the elderly lack efficient action planning and the most common reason for falls in the elderly is incorrect transfer or shift of bodyweight, like leaning too far from one's base of support. From these reports, one can reasonably speculate that reaching, especially inefficient reach planning such as over- or underestimation, may cause one to lean too far from their base of support, therefore increasing risk of falling. In other words, many falls in the elderly can be linked to reaching. Furthermore, a motor imagery training program is believed to improve motor planning and reduce fall risk. Therefore, the purpose of

this study is to determine the effects a 4-week reach-specific motor imagery training program has on reach-estimation.

Study Objectives

To determine the effect of:

- a reach-specific motor imagery training program on the improvement of reach estimation.
- a reach-specific motor imagery training program on reach estimation in three conditions (seated, standing-on-2-feet, standing-on-1-foot).
- motor imagery training on reach estimation between different age groups (i.e. *Group 2*, aged 65-73, and *Group 3*, aged 74-81).

Study Predictions

I hypothesized that:

- after going through a 4-week, reach-specific motor imagery training program, participants would improve overall accuracy of their reach estimation from their original testing.
- the control group (*Group 1*), would have no noticeable improvement in accuracy of reach estimation over the 4-week timespan.
- participants would have less accurate reach estimation when standing as compared to seated.
- participants would have less accurate reach estimation when standing-on-1-foot as compared to standing-on-2-feet or seated.

- after going through a 4-week, reach-specific motor imagery training program, *Group 2* participants (aged 65-73) would show greater improvement of reach estimation accuracy as compared to *Group 3* participants (aged 74-81).

SECTION II

METHODOLOGY

Participants

A total of 23 adults between the ages of 65 and 81 years old were recruited from a senior living community in South Texas for this study. Participants did not have any neuromuscular condition that would significantly affect their ability to walk and reach without an assistive device nor had any impairments to visual or auditory acuity. There was one control group (*Group 1*) made up of 9 participants who did not receive the intervention. Since I was predicting differences in the effectiveness of training depending on age, participants in the intervention group were divided in two different groups based on age: *Group 2* (65 to 73 years; $n = 8$) and *Group 3* (74 to 81 years; $n = 6$). Both intervention groups went through the same process and training. At the end of the study, participants received an assessment of the accuracy of their reach ability associated with estimated reach and their balance confidence. This study was approved by the Texas A&M University and the University of Texas at San Antonio Institutional Review Board (IRB).

Assessment of Reach-Estimation

Some of the following section, in regards to the design and implementation of the assessment of reach-estimation, has been modified, with permission, from Cordova and Gabbard (2014) [15].

Experimental Set-Up

Tests of reach-estimation were administered to each participant prior to the start of and at the completion of the motor imagery training program as a pre- and post-test. The participant

completed the tests in the following positions: seated, standing-on-2-feet, standing-on-1-foot. Each condition was first assessed for actual maximum reach, which was used as the comparison for imagined reaches. Actual and imagined reach responses were determined via use of a specialized short-throw projection system, *Sanyo Model PLC-XL5*, programmed with Visual Basic for data collection. Visual images were systematically projected onto a table surface at midline (90^{o}).

Visual images were projected onto a dark colored tabletop and reach targets consisted of white 2 cm diameter circles. A fixation point was projected onto a rectangular box (with a 45 degree angle surface) placed at midline approximately 45 cm from the most distal target. Participants fixated on the point between trials to remove any bias or cue for the response trials. **Figure 1** presents an illustration of the general experiment setup.

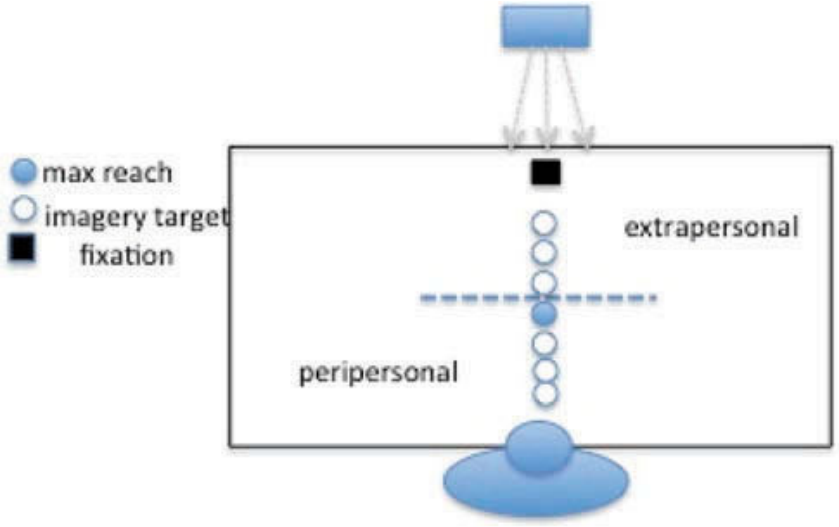

Figure 1. An illustration of the assessment of reach-estimation general experimental set-up.

With the Seated condition, participants sat in a chair aligned with the midline of the table and projected image midline.

For the standing (2- and 1- foot) conditions, table height was adjusted to be mid-chest high. With the standing-on-2-feet condition, participants began by positioning both feet comfortably.

With the standing-on-1-foot condition, participants used their dominant foot to complete the trials. Participants began by standing on both feet with the dominant foot aligned with the midline of the table. When instructed, the non-dominant foot was raised to a comfortable level - approximately 3 inches off the floor.

The experimental setup was established and conducted in an isolated room at the senior living community resident facility.

Experimental Execution

To execute the actual assessment of reach-estimation, the participants were systematically positioned, in regards to what was previously stated above for the corresponding condition. The participants' torsos were positioned approximately 6 inches from the edge of the table. Participants were then introduced to the task for determining 'actual' maximum reach. Maximum reach was determined by having the participant slide a penny under the middle finger of his or her dominant limb to full extension. This position then had to be maintained for three seconds without losing balance. The purpose of using the penny was to minimize the possibility of participants placing body weight (with the torso) on the table's edge by leaning during actual

reach measurement. The participant was allowed three attempts with the farthest attempt being recorded as their maximum reach. **Figure 2** diagrams the body positions for maximum reach for each of the conditions.

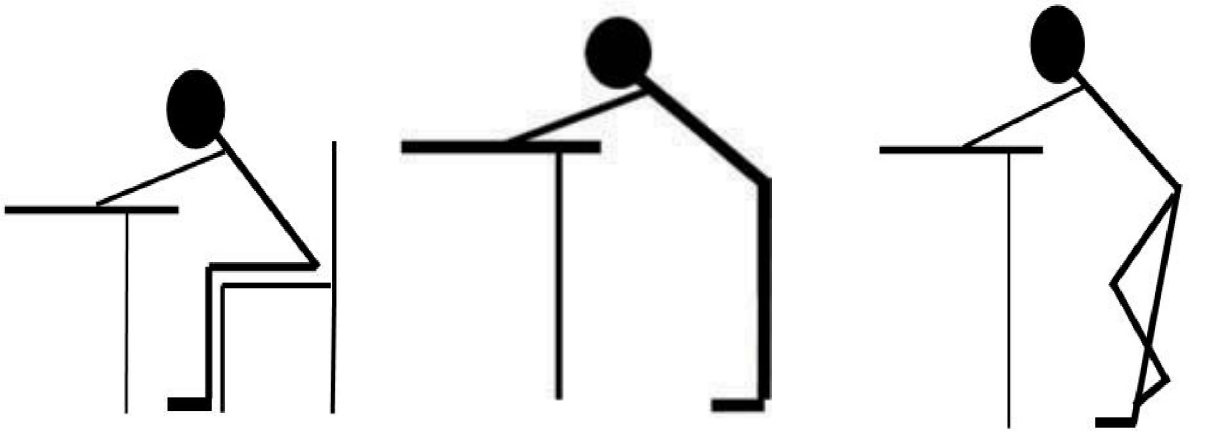

Figure 2. Demonstrations of the body positions of the participants during the measurement of 'actual' maximum reach.

Based on maximum reach, seven imagery targets (2 cm diameter) were randomly programmed with one target location representing actual reach, complemented with three target sites farther than the participant's maximum reach (extrapersonal) and three sites closer than the participant's maximum reach (peripersonal) (**Figure 1**). In essence, actual reach was 'scaled' to individual arm lengths, therefore allowing acceptable comparison. Participants were asked to focus while using motor imagery to 'feel' themselves (first-person perspective) executing the movement with their dominant limb. This process encouraged participants to be more sensitive to the biomechanical constraints of the (motor imagery) task.

At the start of each condition, participants placed their hands to their side or in their lap. Participants were asked to make reach estimation judgments using motor imagery relative to whether the target was within reach ("yes" or "no"). Each participant was trained and provided

practice in use of motor imagery. For response trials, data collection began with a 5 second "Ready!" signal –immediately followed by a fixation point lasting 3 seconds. A target image appeared immediately thereafter and lasted 3 seconds. Once the target image disappeared an immediate (after imaging) verbal response of "yes" or "no" was required. Target presentation was given in random order with 5 trials at each of the seven targets, for a total of 35 trials.

This entire process was repeated for each of the conditions for each participant in the study. In order to prevent improvement based on practice, the order of the conditions for each participant was randomized.

Motor Imagery Training Program

The motor imagery training program was developed by Gabbard and Fox at Texas A&M University in 2014. The complete 4-week motor imagery training program can be found in **Appendix A**. This program lasted 15-60 minutes, 3 times per a week for 4 weeks and followed previously researched recommendations from Gabbard and Fox[2]. The suggested strategies for designing a motor imagery training program to improve motor representation action planning include:

1. *Clear and effective script of instructions.* A specific script of instructions needs to be used for the training detailing thought processes and considerations for the participants.
2. *Goal-setting.* Goal-setting is good practice when trying to accomplish a specific task and could positively impact performance.
3. *First-person internalizing.* Focusing on performing the action from within oneself. This includes considering and understanding one's own capabilities and possible consequences of movement.
4. *Concentration on the effectors.* Focusing on the specific body parts that are performing the action.

5. *Focus on visual cues (objective/goal).* Concentrate on the final result (the objective) of the intended action.

6. *Reinforcement on kinesthetically feeling execution of movement.* Really focus on 'feeling' oneself, rather than 'seeing' oneself perform the movement. This helps promotes effective mental representation.

7. *Combine physiotherapy with mental practice*. This involves having the person actually perform the action, not just mental representation of the action. This allows a person to gain a better understanding of their capabilities and possibly allows a person to experience potential consequences of an action.

8. *Progress from simple to more complex.* To build a foundation and have continued improvement and variety in situations.

9. *Practice 15-60 minutes, 3 times per week, for 4 weeks.* This is the timeframe commonly suggested and used for many motor training programs regarding other studies.

Suggestions from Gabbard and Fox [2] addressed in the single session training programs included "combining physiotherapy [actually performing the actions] with mental practice" and "progressing from simple to more complex." For example, "combining physiotherapy with mental practice" was seen when the facilitator had the participant attempt to actually reach for the object after saying whether they thought they had to over-reach, under-reach, or perform neither to successfully reach the object. This provided the participant with experience to assist them in planning and determining the reach action needed for the next exercise. "Progress[ing] from simple to more complex" was seen by gradually changing levels (i.e. seated, standing, reaching up) and objects (i.e. newspaper, pen, paperclip, etc.).

Recommendations from Gabbard and Fox [2] not directly addressed in the single session training plan were focused on in the facilitator's script for each session. This included, but was not limited to, strategies like "clear and effective script instructions," "goal-setting," and

"reinforcement on kinesthetically 'feeling' execution of movement." The facilitator's script can be found in **Appendix B**.

Procedures

After a simple explanation of the study was discussed, all participants (*Groups 1, 2, 3*) were given consent forms to review and sign. After completing the consent form, participants completed a Pre-Screening Questionnaire. This questionnaire gathered basic demographic and contact information, as well as evaluated whether or not participants met the medical and physical criteria necessary to participate in the study. See **Appendix C** for a copy of this questionnaire.

At the conclusion of these forms, all participants (*Groups 1, 2, 3*) went on to complete the pre-testing of assessment of reach-estimation, which was previously explained in detail, in three different conditions (seated, standing-on-2-feet, standing-on-1-foot). The order of the conditions were randomly determined for each participant in order to account for possible improvement with practice.

The following week, the participants in the intervention groups (*Groups 2, 3*) began motor imagery training. The training program, which was previously explained, was done 3 times a week (Monday, Wednesday, Friday) for 4 weeks. The complete training program can be found in **Appendix A**. Participants were encouraged to attend the training at the same time each day, but variations were made to correspond with participants' schedules. The trainings were one-on-one sessions that started out lasting approximately 15 minutes and gradually lengthened in time

to no longer than 60 minutes. Each training session began with a relaxation segment, followed by a complete, detailed explanation/reminder of how the training will be organized, as well as how to use motor imagery throughout the entirety of the session. The detailed script that was used can be found in **Appendix B**.

Finally, on the last day of the training, all participants (*Groups 1, 2, 3*) completed the post-test assessment of reach-estimation, which was done following the same procedures as mentioned in the assessment of reach-estimation pre-test.

Throughout the entire process, participants were instructed to not hesitate to ask if they had any questions or needed clarification.

Treatment of the Results

A three-way repeated analysis of variance (ANOVA) procedure was used to compare the three independent variables in the study, Time (2) by Condition (3) by Group (3), main effects concerning Total Score. Time was represented by pre- and post-tests (differing by a 4-week span), Condition by the three reach positions used during the pre- and post-test (seated, standing-on-2-feet, standing-on-1-foot), and the three groups of participants (*Group 1*, the control group; *Group 2*, aged 65-73; *Group 3*, aged 74-81).

Total score was defined as the number of correct responses of assessment of reach-estimation out of the total number of trails (35). That is, how many times the participant correctly responded

"yes" when the target was within their actual reach and correctly responded "no" when the target was out of their actual reach.

Next, a three-way repeated analysis of variance (ANOVA) to compare the Treatment (2) by Condition (3) by Time (2) was used. As appropriate, post hoc analyses using Duncan's Multiple Range tests were performed for all analysis and the level of acceptance was set at (p <.05).

Error distribution across targets was calculated using frequency data analyses and chi-square procedures. For the seven reach targets, targets 1-4 were considered peripersonal (within reach) space, whereas targets 5-7 were defined as extrapersonal (beyond reach) space. Five "dots" appeared at each of the 7 targets to get a total of 35 "dots" during the assessment of reach-estimation test.

Another ANOVA procedure was used to determine the general direction of error in terms of mean bias (i.e., over- or underestimation; how much were they off). These values were derived from mean error (cm) minus actual reach (target 4) by assigning the targets in extrapersonal space a positive value and those targets presented in peripersonal space a negative value. Values were then summed to provide a signed mean bias; values with a negative value corresponded to an underestimation whereas values with a positive value corresponded to an overestimation.

SECTION III

RESULTS

Overall results revealed a main effect for Time (pre-test vs. post-test) $F(1,21) = 5.68$, $p < .05$; but no difference in Condition (seated, standing-on-2-feet, standing-on-1-foot) $F(2,29) = 0.09$, $p = .77$, or Group, $F(2,42) = 1.57$, $p = .21$. Results indicated no significant interaction. **Table 1** shows mean reach estimation scores for intervention groups (*Group 2* and *Group 3* combined) and the control group (*Group 1*) for time and condition.

	Seated	**Standing-on-2-feet**	**Standing-on-1-foot**
Pre-Intervention Group	25.21	29.07	25.50
Post-Intervention Group	28.53	29.46	28.42
Pre-Control Group	27.91	27.55	29.60
Post-Control Group	29.00	29.36	29.11

Table 1. Mean reach estimation scores for Time and Condition with intervention groups combined.

Condition

When comparing reach estimations in the three conditions (seated, standing-on-2-feet, standing-on-1-foot), there was no significant main effect. Participants did not have significantly different total scores in the seated ($M = 27.53$), standing-on-2-feet ($M = 29.07$), and standing-on-1-foot ($M = 27.93$) conditions, $F(2, 42) = 1.27$, $p = .29$ (see **Table 1**).

Group

In regard to total scores across conditions, results for the three groups indicated no significant difference. The Control group ($M = 28.76$), compared to *Group 2* ($M = 27.41$) and *Group 3* ($M = 28.63$); $F(2, 20) = 0.88$, $p = .43$) were all statistically similar.

Training Effect

Figure 3 shows pre- and post-test comparisons for groups with conditions combined. Results indicated no significant difference for the *Group 1* (control); pre-test ($M = 28.353$) and post-test ($M = 29.15$). However, there was a significant difference (increase) with the intervention group (both *Group 2* and *Group 3* combined); pre-test ($M = 27.339$) and post-test ($M = 29.02$), $F(1,21) = 4.89$, $p < .05$ (see **Figure 3**). **Figure 4** shows the training effect in regards to time across all conditions with the intervention groups combined (*Group 2, 3*).

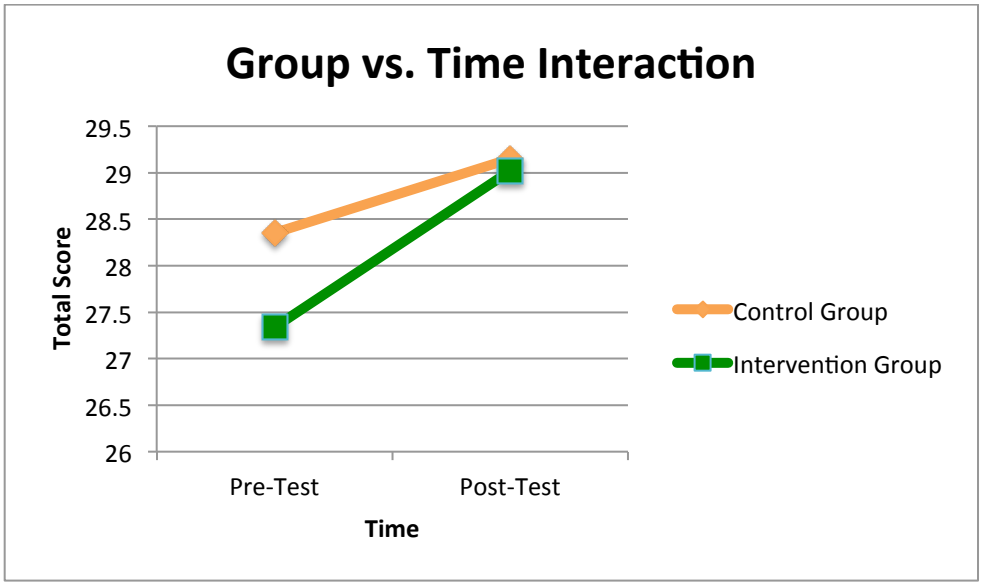

Figure 3. The comparison of pre- and post-test scores between the intervention group (*Group 2* and *Group 3* combined) and the control group (*Group 1*).

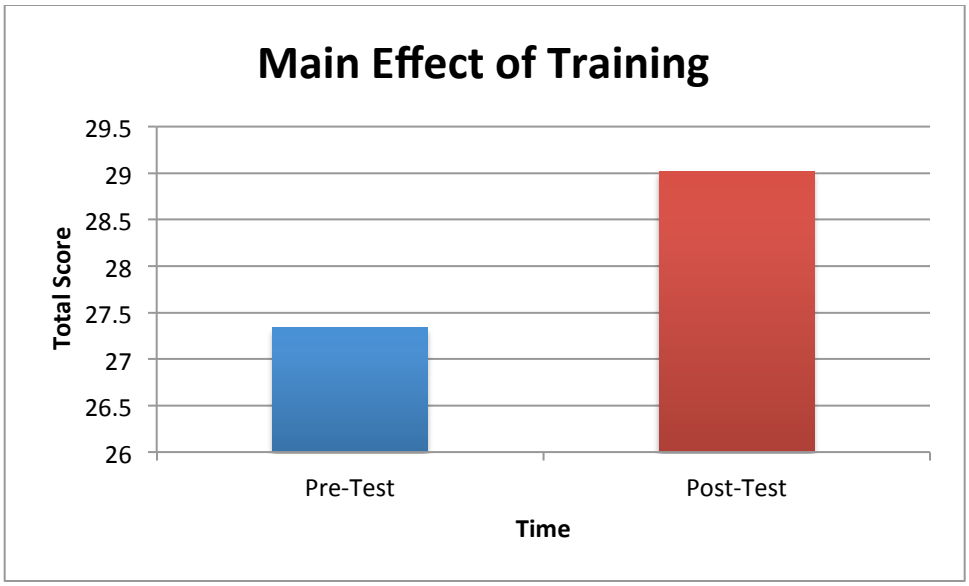

Figure 4. The total scores obtained across both intervention groups (*Group 2, 3*) combined and all conditions from the reach estimation tests before and after intervention with the motor imagery training program.

Bias

In regard to mean bias, results revealed that there was a significant bias in reference to Time (pre-test = 0.39 cm compared to post-test = -0.03cm; $F(1, 21) = 7.67$, $p < .05$) but no differences for Condition ($F(2, 42) = 0.33$, p .72) and Group ($F(1, 29) = 0.57$, $p =$ .46). That is, participants overestimated, although slightly, at the pre-test and underestimated in the post-test. We wish to note that, from a practical perspective, the differences are inconsequential.

SECTION IV

CONCLUSIONS AND APPLICATIONS

With the present study, I compared a control and two motor imagery training groups categorized by age, 65-73 (*M* = 70) and 74-81 (*M* = 80) years, on reach estimation. I predicted that those who participated in the training programs would show an overall improvement in reach estimation accuracy. Our findings supported this hypothesis, showing that a 4-week motor imagery training program did have a positive effect on participants' estimation of reachability. For example, I observed that participants were significantly better at identifying which targets were within or out of their reach after going through the training. While the values seem small (pre-test = 0.39 cm compared to post-test = -0.03 cm), the direction of the error data is important, showing that there is much less error after the intervention since participants were almost at a '0' error. As expected, there was no significant change in *Group 1*'s scores.

I hypothesized that participants would have less accurate reach estimation when standing as compared to seated. I also predicted that participants would have less accurate reach estimation when standing-on-1-foot as compared to standing-on-2-feet or seated. Our results noted no significant difference between reach conditions, a result that is somewhat surprising based on previous research. Previous studies have shown that participants are more accurate while seated compared to standing. Standing is "a complicated task that involves the action of muscles distributed over the whole body" [16]. When you are standing, even if on two feet, your central nervous system has to focus a lot more on making sure your body stays positioned correctly in the environment in comparison to when you are seated. The premise for these findings is that

with standing, there is more 'risk' associated with the reach, since you are more likely to lose your balance without a sturdy object (i.e. chair) for support. Additionally, the more thought processes and focus that is required with standing-on-2-feet, let alone one foot, means that there is typically more error in processing other action movements and judgments. Even though participants were more likely to lose their balance, or fall while standing-on-1-foot compared to standing-on-2-feet or seated, this instability did not affect their reaching estimations. Speculatively, participants were more conservative or uncertain about their reachability, resulting in underestimation.

It is important to point out that all of the participants in this study were around the same age, and this could help explain why their accuracies were similar for all conditions. Another speculative point is that these participants were not sedentary, but rather fairly active due to the nature of the senior living community they resided in. Therefore, this could provide another explanation as to why their judgments of reachability were similar across conditions.

Closer inspection of the data concerning over- or underestimation bias showed no significance between conditions and age groups. The difference, although slight that did emerge was related to the training effect, showing that after training, there was a slight underestimation (-0.03cm). But, as noted, that difference was not significant.

Another insight I obtain from the results is that perhaps the training should be longer than just 4 weeks. With longer training, participants are more likely to improve their motor imagery strategies that could have a significant effect on outcome.

As expected, *Group 1* participants (control group) had no significant improvements in reach-estimation over the course of the 4-weekmotor imagery training program. But, this could have resulted from the fact that *Group 1* was "maxed out" during the pre-test. In other words, because the *Group 1* as a whole scored so high during the pre-test, they didn't have very much room for improvement on the post-test. In the future, all the participants should be pre-tested and then placed into groups that start at a similar baseline. This will help to better identify the true level of reach-estimation improvement, or lack thereof, among *Group 1*.

Greater improvement was expected from the *Group 2* participants (65 to 73 years) than from the *Group 3* participants (74 to 81 years). In addition, both groups were predicted to have greater improvement than the *Group 1*. Although total scores where not significantly different in the end, the intervention groups (*Groups 2, 3*) showed improvement over the 4-week training program, while the control group's scores (*Group 1*) were similar. These results might have been due to the fact that the number of participants in each group was too small; sample size was a limitation of the study. Increasing the overall number of participants might decrease the effect that individual differences have in each group. In any case, the training program used in the present study shows promise and warrants further inquiry.

In addition to the known physical consequences that can result from falls, it also causes significant psychological impacts. Falls often negatively impact an elderly person's ability to function independently and their overall psychological well-being [17]. Often times, a fall results in a voluntary reduction in activity due to a fear of falling in the future. This limitation on

activity is directly related to a decline in one's self-esteem and self-confidence levels [18]. In turn, one's independence and quality of life diminishes. Due to the drastic effects falling has on psychological health, in the future, pairing motor imagery training with a self-report questionnaire that measures confidence in balance could prove logical and useful. Previously established questionnaires like the *Activities-specific Balance Confidence (ABC) Scale* or the *Falls Efficiency Scale International (FES-I),* in addition to the newly developed *Reach-Specific Balance Confidence (RBC) Scale,* created by Gabbard and Fox from Texas A&M University (2014), are possible tools that could be used to study the effects of motor imagery training on psychological wellness.

As it was mentioned at the beginning of this research, the elderly population is a growing group in society. Their well-being is a major concern for everyone. Because of this, there is a great need to develop strategies and find solutions to limit the amount of falls and injuries that are suffered by these individuals every day. This study, along with previous research, shows that motor imagery training could be a potential solution to this problem and it might lead to a reduction in accidents and fatalities due to falling. If future research continues to find mental imagery training successful, this training could be implemented in nursing homes, rehabilitation centers, and senior living facilities. Resulting in lower medical costs and improvement in the everyday living of our senior citizens.

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APPENDIX A

Motor Imagery Training Program

Week 1, Day 1

1. Explain program, goals, etc.
2. Position: Seated (record which hand person uses)
    a. Reaching for Cup
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. 3 inch over-reach
            2. 2 inch under-reach
            3. no over- or under-reach
            4. 1 inch under-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 0 degrees with 2 inch under-reach
            2. 135 degrees with no over- or under-reach
            3. 165 degrees with 2 inch under-reach
            4. 30 degrees with 3 inch over-reach
    b. Reaching for Remote
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. 3 inch under-reach
            2. no over-reach or under-reach
            3. 1.5 inch under-reach
            4. 1 inch over-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 135 degrees with 2 inch over-reach
            2. 20 degrees with no over- or under-reach
            3. 165 degrees with no over- or under-reach
            4. 120 degrees with 3 inch under-reach

Week 1, Day 2

1. Position: Seated (record which hand person uses)
    a. Reaching for Remote
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. 4 inch over-reach
            2. 1 inch under-reach
            3. no over- or under-reach
            4. 2 inch over-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)

1. 15 degrees with no over- or under-reach
2. 150 degrees with 1 inch over-reach
3. 110 degrees with 2 inch under-reach
4. 20 degrees with 2 inch over-reach

b. Reaching for a Newspaper
   i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
      1. 3 inch over-reach
      2. no over- or under-reach
      3. 1 inch under-reach
      4. 2 inch over-reach
   ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
      1. 155 degrees with no over- or under-reach
      2. 30 degrees with 4 inch over-reach
      3. 45 degrees with 1 inch over-reach
      4. 180 degrees with 2 inch under-reach

2. Position: Standing (1 foot away from table, elevated table) – record which hand person uses
   a. Reaching for a Newspaper
      i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
         1. 2 inch under-reach
         2. 4 inch over-reach
         3. no over- or under-reach
         4. 1 inch under-reach
      ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
         1. 165 degrees with 3 inch over-reach
         2. 70 degrees with no over- or under-reach
         3. 35 degrees with 3 inch under-reach
         4. 150 degrees with 4 inch over-reach

Week 1, Day 3

1. Position: Seated (record which hand person uses)
   a. Reaching for a Spoon
      i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
         1. 1 inch over-reach
         2. 4 inch under-reach
         3. no over- or under reach
         4. 2 inch over-reach
      ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
         1. 145 degrees with no over-or under-reach
         2. 105 degrees with 1 inch under-reach

3. 10 degrees with 3 inch over-reach
4. 30 degrees with 1 inch over-reach

2. Position: Standing (1 foot away from table, objects on box on table) – record which hand person uses
    a. Reaching for Spoon
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. 2.5 inch over-reach
            2. 2 inch under-reach
            3. no over- or under-reach
            4. 1.5 inch over-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 75 degrees with 3 inch under-reach
            2. 100 degrees with 2 inch over-reach
            3. 30 degrees with 1 inch over-reach
            4. 60 degrees with no over- or under-reach
    b. Reaching for a Pen
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. No over- or under-reach
            2. 3 inch under-reach
            3. 1 inch over-reach
            4. no over- or under-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 145 degrees with 2 inch over-reach
            2. 60 degrees with 1 inch under-reach
            3. 20 degrees with no over- or under-reach
            4. 120 degrees with 3 inch over-reach

Week 2, Day 1

1. Position: Standing (1 foot away from table, elevated table) – hands used are stated
    a. Reaching for Cup
        i. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 15 degrees with no over- or under-reach (left hand)
            2. 150 degrees with 1 inch over-reach (right hand)
            3. 110 degrees with 2 inch under-reach (right hand)
            4. 20 degrees with 2 inch over-reach (left hand)
    b. Reaching for a Newspaper
        i. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 155 degrees with no over- or under-reach (right hand)
            2. 30 degrees with 4 inch over-reach (left hand)

3. 45 degrees with 1 inch over-reach (left hand)
4. 180 degrees with 2 under-reach (right hand)

c. Reaching for Remote
   i. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
      1. 0 degrees with 2 inch under-reach (left hand)
      2. 135 degrees with no over- or under-reach (right hand)
      3. 165 degrees with 2 inch under-reach (right hand)
      4. 30 degrees with 3 inch over-reach (left hand)

d. Reaching for Spoon
   i. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used are stated
      1. 135 degrees with 2 inch over-reach (right hand)
      2. 20 degrees with no over- or under-reach (left hand)
      3. 165 degrees with no over- or under-reach (right hand)
      4. 120 degrees with 3 inch under-reach (left hand)

Week 2, Day 2

1. Position: Standing (1 foot away from table, elevated table)
   b. Reaching for Pen
      i. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
         1. 15 degrees with no over- or under-reach (left hand)
         2. 150 degrees with 1 inch over-reach (right hand)
         3. 110 degrees with 2 inch under-reach (right hand)
         4. 20 degrees with 2 inch over-reach (left hand)
   c. Reaching for Die (record which hand person uses)
      iii. Four Different Positions in a Line (have person far to the side of where the angles are marked)
         1. 4 inch over-reach
         2. 1 inch under-reach
         3. no over- or under-reach
         4. 2 inch over-reach
      ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
         1. 155 degrees with no over- or under-reach
         2. 30 degrees with 4 inch over-reach
         3. 45 degrees with 1 inch over-reach
         4. 180 degrees with 2 inch under-reach
2. Position: Standing and Reaching Down to Table
   a. Reaching for Cup
      i. Four Different Positions in a Line (have person far to the side of where the angles are marked) - record which hand person uses
         1. 3 inch over-reach
         2. no over- or under-reach
         3. 1 inch under-reach

4. 2 inch over-reach

ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left) (record which hand person uses)
    1. 135 degrees with 2 inch over-reach
    2. 20 degrees with no over- or under-reach
    3. 165 degrees with no over- or under-reach
    4. 120 degrees with 3 inch under-reach

Week 2, Day 3

1. Position: Standing (1 foot away from table, elevated table) – record which hand person uses
    a. Reaching for a Paperclip
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. 1 inch over-reach
            2. 2 inch under-reach
            3. no over- or under reach
            4. 2 inch over-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 145 degrees with no over-or under-reach
            2. 105 degrees with 1 inch under-reach
            3. 10 degrees with 3 inch over-reach
            4. 30 degrees with 1 inch over reach
2. Position: Standing and Reaching Down to Table
    a. Reaching for Cup
        i. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 75 degrees with 1 inch under-reach (right hand)
            2. 100 degrees with 2 inch over-reach (left hand)
            3. 30 degrees with 1 inch over-reach (right hand)
            4. 60 degrees with no over- or under-reach (left hand)
    b. Reaching for a Remote (record which hand person uses)
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
            1. No over- or under-reach
            2. 2 inch over-reach
            3. 1 inch under-reach
            4. no over- or under-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
            1. 145 degrees with 2 inch over-reach
            2. 60 degrees with 1 inch under-reach
            3. 20 degrees with no over- or under-reach
            4. 120 degrees with 3 inch over-reach
    c. Reaching for a Spoon (record which hand person uses)

i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
    1. 3 inch over-reach
    2. no over- or under-reach
    3. 1 inch under-reach
    4. 2 inch over-reach

ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
    1. 155 degrees with no over- or under-reach
    2. 30 degrees with 3 inch over-reach
    3. 45 degrees with 1 inch over-reach
    4. 180 degrees with 2 under-reach

Week 3, Day 1

1. Position: Standing and Reaching Down to Table
    a. Reaching for Remote
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
            1. 3 inch over-reach
            2. 2 inch under-reach
            3. no over- or under-reach
            4. 1 inch under-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
            1. 0 degrees with 1 inch under-reach (left hand)
            2. 135 degrees with no over- or under-reach (right hand)
            3. 165 degrees with 2 inch under-reach (right hand)
            4. 30 degrees with 1 inch over-reach (left hand)
    b. Reaching for Spoon
        i. Four Different Positions in a Line (have person far to the side of where the angels are marked) – record which hand person uses
            1. 1 inch under-reach
            2. no over-reach or under-reach
            3. 1.5 inch under-reach
            4. 2 inch over-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
            1. 135 degrees with 2 inch over-reach (right hand)
            2. 20 degrees with no over- or under-reach (left hand)
            3. 165 degrees with no over- or under-reach (right hand)
            4. 120 degrees with 1 inch under-reach (left hand)
    c. Reaching for a Pen
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked) - record which hand person uses
            1. 2 inch under-reach
            2. 1 inch over-reach

3. no over- or under-reach
4. 1 inch under-reach

ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
1. 155 degrees with no over- or under-reach (right hand)
2. 30 degrees with 3 inch over-reach (left hand)
3. 45 degrees with 2 inch over-reach (left hand)
4. 180 degrees with 1 under-reach (right hand)

d. Reaching for a Die (record which hand person uses)
i. Four Different Positions in a Line (have person far to the side of where the angles are marked)
1. No over- or under-reach
2. 2 inch over-reach
3. 1 inch under-reach
4. no over- or under-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
1. 145 degrees with 2 inch over-reach
2. 60 degrees with 1 inch under-reach
3. 20 degrees with no over- or under reach
4. 120 degrees with 3 inch over-reach

Week 3, Day 2

1. Position: Standing and Reaching Down to Table
a. Reaching for a Pen
i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
1. 1 inch over-reach
2. 1 inch under-reach
3. no over- or under reach
4. 2 inch over-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
1. 145 degrees with no over-or under-reach (right hand)
2. 105 degrees with 1 inch under-reach (right hand)
3. 10 degrees with 2 inch over-reach (left hand)
4. 30 degrees with 1 inch over-reach (left hand)

b. Reaching for Die
i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
1. 3 inch over-reach
2. 2 inch under-reach
3. no over- or under-reach
4. 1 inch under-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – had used is stated
1. 15 degrees with no over- or under-reach (left hand)

2. 150 degrees with 1 inch over-reach (right hand)
3. 110 degrees with 2 inch under-reach (right hand)
4. 20 degrees with 2 inch over-reach (left hand)

c. Reaching for Paperclip
   i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
      1. 2.5 inch over-reach
      2. 1 inch under-reach
      3. no over- or under-reach
      4. 1.5 inch over-reach
   ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
      1. 75 degrees with 1 inch under-reach (left hand)
      2. 100 degrees with 2 inch over-reach (right hand)
      3. 30 degrees with 1 inch over-reach (left hand)
      4. 60 degrees with no over- or under-reach (left hand)

2. Position: Standing 1 foot away from wall, facing wall (reaching above the head) – record which hand person uses
   a. Reaching for a Mark on Wall (dark laminated paper object 8in X 2in)
      i. Four Different Positions in a Line
         1. 2 inch under-reach
         2. 3 inch under-reach
         3. no over- or under-reach
         4. 1 inch over-reach
      ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left) - record which hand person uses
         1. 135 degrees with 2 inch over-reach
         2. 20 degrees with no over- or under-reach
         3. 165 degrees with no over- or under-reach
         4. 120 degrees with 1 inch under-reach

Week 3, Day 3

1. Position: Standing and Reaching Down to Table
   a. Reaching for Die
      i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
         1. 3 inch over-reach
         2. 1 inch under-reach
         3. no over- or under-reach
         4. 1 inch over-reach
      ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left)
         1. 15 degrees with no over- or under-reach (right hand)
         2. 150 degrees with 1 inch over-reach (right hand)
         3. 110 degrees with 2 inch under-reach (left hand)
         4. 20 degrees with 2 inch over-reach (left hand)

b. Reaching for a Paperclip
    i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
        1. 1 inch over-reach
        2. no over- or under-reach
        3. 1 inch under-reach
        4. 2 inch over-reach
    ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
        1. 155 degrees with no over- or under-reach (right hand)
        2. 30 degrees with 3 inch over-reach (left hand)
        3. 45 degrees with 1 inch over-reach (right hand)
        4. 180 degrees with 2 inch under-reach (right hand)

2. Position: Standing 1 foot away from wall, facing wall (reaching above the head)
    a. Reaching for Mark on Wall (dark laminated paper object 8in X 2in)
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
            1. No over- or under-reach
            2. 2 inch under-reach
            3. 1 inch over-reach
            4. no over- or under-reach
        ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
            1. 145 degrees with 2 inch over-reach (right hand)
            2. 60 degrees with 1 inch under-reach (left hand)
            3. 20 degrees with no over- or under reach (left hand)
            4. 120 degrees with 2 inch over-reach (right hand)
    b. Reaching for Mark on Wall (dark laminated paper object 4in X 1.25in)
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
            1. 3 inch over-reach
            2. 2 inch under-reach
            3. no over- or under-reach
            4. 1 inch under-reach
        ii. Four different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – record which hand person uses
            1. 155 degrees with no over- or under-reach
            2. 30 degrees with 4 inch over-reach
            3. 45 degrees with 1 inch over-reach
            4. 180 degrees with 2 inch under-reach

Week 4, Day 1

3. Position: Standing 1 foot away from wall, facing wall (reaching above the head)
    a. Reaching for Mark on Wall (dark laminated paper object 8in X 2in)
        i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses

1. 3 inch over-reach
2. 2 inch under-reach
3. no over- or under-reach
4. 1 inch under-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
1. 0 degrees with 2 inch under-reach (left hand)
2. 135 degrees with no over- or under-reach (right hand)
3. 165 degrees with 2 inch under-reach (right hand)
4. 30 degrees with 3 inch over-reach (left hand)

b. Reaching for Mark on Wall (dark laminated paper object 4in X 1.25in)
i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
1. 3 inch under-reach
2. no over- or under-reach
3. 1.5 inch under-reach
4. 1 inch over-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
1. 135 degrees with 2 inch over-reach (right hand)
2. 20 degrees with no over- or under-reach (left hand)
3. 165 degrees with no over- or under-reach (right hand)
4. 100 degrees with 3 inch under-reach (left hand)

c. Reaching for Mark on Wall (dark laminated paper object 1in X 1in)
i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
5. 2 inch under-reach
6. 3 inch over-reach
7. no over- or under-reach
8. 1 inch under-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
9. 165 degrees with 2 inch over-reach (right hand)
10. 70 with no over- or under-reach (left hand)
11. 35 degrees with 3 inch under-reach (left hand)
12. 150 degrees with 1 inch over-reach (right hand)

d. Reaching for Mark on Wall (dark laminated paper circle 0.5in. diameter)
i. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
1. 2.5 inch over-reach
2. 2 inch under-reach
3. no over- or under-reach
4. 1.5 inch over-reach

ii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – record which hand person uses
1. 75 degrees with 3 inch under-reach

2. 100 degrees with 2 inch over-reach
3. 30 degrees with 1 inch over-reach
4. 60 degrees with no over- or under-reach

Week 4, Day 2

1. Position: Standing 1 foot away from wall, facing wall (reaching above the head)
    a. Reaching for Mark on Wall (dark laminated paper square 1in X 1in)
        i. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
            1. 15 degrees with no over- or under-reach (left hand)
            2. 150 degrees with 1 inch over-reach (right hand)
            3. 110 degrees with 2 inch under-reach (right hand)
            4. 20 degrees with 2 inch over-reach (left hand)
    b. Reaching for Mark on Wall (dark laminated paper circle 0.5in. diameter)
        ii. Four Different Positions in a Line (have person far to the side of where the angles are marked) – record which hand person uses
            5. No over- or under-reach
            6. 3 inch under-reach
            7. 1 inch over-reach
            8. no over- or under-reach
        iii. Four Different Positions at Angles (with 90 degrees in front and 0 degrees to the left) – hand used is stated
            1. 145 degrees with 2 inch over-reach (right hand)
            2. 60 degrees with 1 inch under-reach (right hand)
            3. 20 degrees with no over- or under reach (left hand)
            4. 120 degrees with 3 inch over-reach (right hand)
    c. SEE INDIVIDUALIZED PLAN. (developed from previously missed items)

Week 4, Day 3

1. SEE INDIVIDUALIZED PLAN. (developed from previously missed items)
2. Post-Testing of Assessment of Reach-Estimation

APPENDIX B

Facilitator's Training Script/Instructions

2-3 minutes of relaxation

1. *"Close your eyes… inhale deeply and exhale slowly"*
2. *"Contract your arm muscles: hands, forearms, upper arms, and shoulders* (3 seconds). *Now relax your body."*
3. *"Contract your leg muscles: feet, lower legs, and thighs* (3 seconds). *Now relax your body."*
4. *"Contract your abdomen and hips* (3 seconds). *Now relax."*
5. *"Try to stay relaxed like that till the end of the session."*

Training Session

6. *"Today you will be judging whether or not you can reach objects and then actually reaching for objects placed at various locations on a table."*
7. *"Throughout the study you are going to have to concentrate and sense what moving your muscles feels like, without actually moving, to determine if you would have to over- or under-reach to grasp and object."*
8. *"Let's see how many you can get correct." "Concentrate and work hard so that we can reduce over- and under-estimation of reaching"*
9. *"What would be a consequence if over- or under-reached for something while [seated / standing]?" "Think about what could be a consequence if you over- or under-estimated reaching for an object while seated / standing. "*
10. *"As you imagine reaching for the [object] try to* ***feel*** *your hand actually wrapping around the object. Watch and feel your hand and fingers reaching and grasping the* **[object],** *without actually executing any motion. Think about how you will reach for the* **[object]** *and how fast you will move as to not drop it/spill its contents. Where does your hand need to be to grasp the object securely?"*
11. *"Try to* ***sense*** *the feeling you have in your body, arm and hand as you reach for the object."*
12. *"In your imagination, start to* ***feel*** *how you are reaching for the object. Try "entering' your body to* ***sense*** *each movement your arm will make and how your hand will contact the object."*
13. *"Concentrate on the* ***feelings*** *on your hand; sense how the object will feel on your fingers as you make contact with it."*
14. Initial measuring for position: Full extension of arm they choose, or is stated for them to use, along a line/angle. Have participant's back against back of chair, no movement of body or torso, **eyes closed**, with hand grasped around object. (Keep measuring tape locked a few inches longer than max reach distance.) – Participant may need to help hold tape measure when measuring angles. MEASURE MAX DISTANCE AS THE BACK EDGE OF THE OBJECT.
15. Have participant leave **[object]** in position and return hands to lap ("resting position") and open eyes.
16. Have the participant extend his or her arm to actually reach for the cup, with **eyes open**, without moving the object, and hold position to check. Make sure the participant is able to grasp the object while fully extended, back against chair, and with no movement of body or torso. Adjust "max" measurement, if needed.
17. Have the participant move their arm to their lap ("resting position") and close their eyes as you place the object in the designated location -> see training program sheet. PLACE OBJECT IN FRONT OF LINE (back of object on the line, with long objects - newspaper, remote, pen, etc.- sideways!)
18. Instruct the participant open his or her eyes.

19. *"By using your kinesthetic imagery, by **feeling** your muscles moving without them actually moving, can you reach the object without over- or under- reaching? **Feel**, rather than just see, yourself perform the action."* If the answer is…..
    a. "**NO**":
        i. *"Do you think you'd have to over-reach or under-reach to successfully grab the object?"*
    b. "**YES**": Proceed to next step.
20. *"Try actually reaching for the object. Focus on your hand and arm when reaching for the object and how it **feels**."*
21. *"Did you have to over- or under-reach?"*
22. *"Try to remember what this action feels like during the training."*
23. CHOOSE:
    a. Next object placed in a straight line: Go back up to #17.
    b. Next object is placed at an angle: Go back up to #14.
    c. Next object is a different object than before: Go back up to #10
    d. Next position is a different position (same or different object): Go back up to #9.

APPENDIX C

Pre-Screening Questionnaire

Name: _____ Gender: Male ☐ Female ☐

Age: _____ Date of Birth: _____

Phone Number: _____ e-mail: _____

Independence:

1. Are you independent in daily activities? Yes ☐ No ☐
2. Do you live with a caretaker? Yes ☐ No ☐

Falls/Near Falls:

3. A fall is defined as unintentionally coming to rest on the ground, floor, or other lower level with or without injury. Have you fallen in the past year (12 months)? Yes ☐ No ☐
   If yes, how many times? _____

4. A near fall is a slip or trip but you were able to catch yourself. Have you experienced a near fall in the past year (12 months)? Yes ☐ No ☐ If yes, how many times? _____

5. Have you visited an emergency room, your family doctor or another health professional as a result of a fall in the past year? Yes ☐ No ☐ If yes, which service? _____

Walking/Reaching Ability:

6. Do you use any walking aids (cane, walker, etc.)? Yes ☐ No ☐
7. Does your general health or a medical condition keep you from walking, bending, or reaching without significant pain/discomfort? Yes ☐ No ☐
   If yes, please describe:

Visual and Auditory:

8. Do you have any visual or auditory acuity impairments? Yes ☐ No ☐
9. Is your vision at least 20/30 (with corrective lenses, if needed)? Yes ☐ No ☐
10. Have you had a vision test in the past 12 months? Yes ☐ No ☐
11. Do you have a prescription for corrective lenses? Yes ☐ No ☐
12. If answer to previous question was "yes," do you wear your corrective lenses as prescribed? Yes ☐ No ☐

Medications:

13. Are you taking any medications that list "dizziness" (or any other side effects that could cause loss of balance/falling) as a side effect? Yes ☐ No ☐

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